A WIRELESS STORM DETECTOR FOR THE CENTRAL LIGHTING STATION.

By HERBERT T. WADE.

(Abstracted from *Scientific American Monthly*, January, 1920, vol. 1, pp. 18-21.)

At large power stations, such as that of the Waterside Station of the New York Edison Co., considerable difficulty in supplying sufficient current may arise with a sudden darkening of the sky at unusual times. This is often true of thunderstorms, when the sky will become dark almost without warning, and thousands of lights will be switched on all over the city almost instantly, increasing the load to such an extent that the power station, unless prepared for such an emergency, can not meet the demand. The substations merely start additional rotary converters, but the load falls back upon the central station.

To combat this the Waterside Station has had mounted on its roof for several years wireless antennæ so arranged that the electrical impulses from a very distant thunderstorm are caused to ring a bell in an office below. When the storm is 100 miles away, and there are no visible signs of its presence the bell will ring every few minutes, with increasing frequency as the storm approaches, until finally when the storm may still be an hour away, the bell will ring constantly. This gives a warning of several hours, which is quite sufficient to call into service boilers which have been banked. Hence, when the storm breaks and the city calls suddenly for light these reserve boilers will have steam ready to turn additional dynamos and supply the required current.—*C. L. M.*

THE AUDIBILITY OF THUNDER.

By C. VEENEMA.

(Abstracted from *Das Wetter*, June, 1917, pp. 127-130; Aug.-Sept., 1917, pp. 187-192; Dec., 1917, pp. 258-262; Mar.-Apr., 1918, 56-68.)

There are two methods of determining the distance of thunder sources—the first by measuring the actual distance and the second by determining the time interval between lightning and thunder. The first method requires at least two observers, or as many more as possible, who will report the time of first thunder, the time of nearest approach of the storm, and whether or not the storm passed directly over the observer. In this manner the path of the storm can be constructed very accurately, and the distance of the thunder determined for any time from a given station. This plan is not feasible for storms approaching from the sea or for those observed over the sea. There is also danger that the first thunder may be confused with other noises, or that the direction may be in error, but these difficulties are largely overcome with practice. The second method, that of determining distance by time interval between lightning and thunder, has advantages and disadvantages also. Only one observer is needed, and the results of his observation can be obtained at once. On the other hand, when there is continuous thunder and frequent lightning, especially at night, when other conditions for obtaining large values for thunder audibility are propitious, it is often difficult to associate a given peal of thunder with its proper flash of lightning. Moreover, the circumstances surrounding the observer must be favorable, or, as frequently happened to the author, the observation will be lost by the passing of a wagon, the roar of the wind, or the noise of the rain, after having counted seconds for a considerable period.

By almost continuous observation of thunderstorms from 1895 to 1916 the following distances occurred for a certain group of observations: On 9 occasions, between 30 and 40 kilometers; on 12 occasions, between 40 and 50 kilometers; on 2 occasions, between 50 and 60 kilometers; on 2, between 60 and 70 kilometers; on 2, between 70 and 80 kilometers; on 1, between 80 and 90 kilometers; and finally on 2 occasions over 100 kilometers. It is of interest to inquire what the maximum distance is, to which thunder could be heard under the most favorable conditions, but this question is dependent upon so many extraneous influences that it is difficult to answer. The author is led, however, to six conclusions, regarding the long distance audibility of thunder:

1. The loudest thunder comes from the strongest and brightest and downward-directed lighting.
2. The intensity of the sound and the degree of quiet surrounding the observer are strongly influential.
3. The evening and night hours appear more favorable for the propagation of sound than the day hours.
4. The wind direction, at least up to the cloud level, appears to have no influence.
5. In late summer and autumn, the audibility conditions are much more favorable than in spring and early summer.
6. The audibility of thunder is diminished by irregularities and turbulence in the atmosphere.

NOTE.—C. J. P. Cave, in Nature (London), October 16, 1919, notes cases where the time interval between flash and thunder was 120 seconds, 170 seconds, and 189 seconds, yielding a maximum distance of 63 kilometers. Capt. Ault, master of the *Carnegie*, has noted, in connection with the audibility of thunder at sea, that when successive intervals between lightning flash and thunder are recorded for a number of flashes, the storm became inaudible when the distance of the storm exceeded 5 miles (Sci. Amer., May 20, 1916, p. 525).—*C. L. M.*

ANOTHER CASE.

On October 16, 1919, at 5:43 and 5:44 p. m. (75th meridian time), looking northward from Chevy Chase, D. C., I observed two tremendous vertical lightning flashes reaching apparently from the overflow mammilated top cloud sheet of the thunderstorm. Brief growls of thunder (the only ones heard) followed in 140 and 132 seconds, respectively, indicating distances of 47 and 44 kilometers; the wind was moderate, southwest. —*C. F. Brooks.*

THE VISIBILITY OF SOUND WAVES.

By FRANK A. PERRET.

[Abstracted from *L'Astronomie*, May, 1919, pp. 193-196.]

Several instances are described in which the sound waves emanating from terrific explosions in volcanoes have actually been made visible by variations in the refraction of light through them. The following explanation is given: "* * * The sound is propagated in the air by means of compression and rarefaction waves, projected radially. The conditions for the production of these arcs are sudden explosions of great magnitude. If they are sufficiently violent, one can imagine that the waves of rarefaction and condensation would change the indices of refraction and reflection, and these zones would be visible by contrast. The visibility by contrast of zones of cold and warm air is well known, and we can easily conceive of an analogous